


January 2018

Agricultural Research Partnerships (ARP) Network NOTES

Welcome to ARP Network Quarterly Notes! Our goal is to keep you informed about ARP Network and Agricultural Research Service's current information. We hope that the notes build networking opportunities for businesses to connect with ARP Network Members.

Please help us spread the word by sharing ARP Network Notes statewide with your company contacts, colleagues, other organizations, etc. Thank you!

ARS

The Agricultural Research Service (ARS) is USDA's primary internal research agency. ARS conducts research to develop and transfer solutions to agricultural problems that are both national and international in scope. ARS has nearly 2,000 scientists nationwide and a few in overseas locations. ARS scientists carry out 690 research projects on a variety of subjects. ARS has a Congressional mandate to disseminate the research findings of these projects to the American public and other interested parties. Learn more by visiting: http://www.ars.usda.gov.

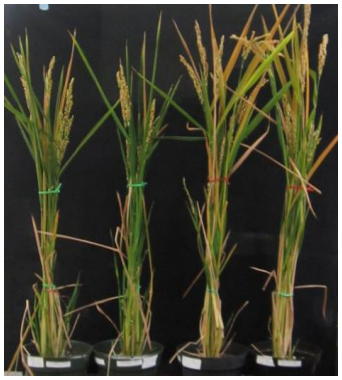
ARP Network

The ARP Network enlists the help of partners to spark economic development, entrepreneurship and community development. USDA ARS founded the ARP Network in an effort to expand the impact of ARS research and provide resources to help companies grow. By combining ARS research expertise with complementary capabilities and talents of partnering organizations, the ARP Network helps stimulate economic growth through technological advancements. The ARP Network matches business needs with ARS innovations and research capabilities and provides business assistant services to help companies and startups solve agricultural problems, develop products and create new jobs. Learn more by visiting: https://www.ars.usda.gov/business/Docs.htm?docid=24715.

ARS Partnership and/or Licensing Opportunities

ARS is looking for commercial partners interested in commercializing these technologies and/or evaluating the technologies for potential commercial applications through a Cooperative Research and Development Agreement (CRADA). Some of these technologies are also available for licensing.

Mutated Rubisco Activase



Photosynthesis is the process that supports plant growth and production of food, feed, fuel and fiber. One of the critical enzymes in photosynthesis is Rubisco activase. Genetically-altered rice plants expressing a shortened form of the protein are more photosynthetically active, under certain conditions, and show increased growth and seed yield in growth chamber and greenhouse trials.

Benefits

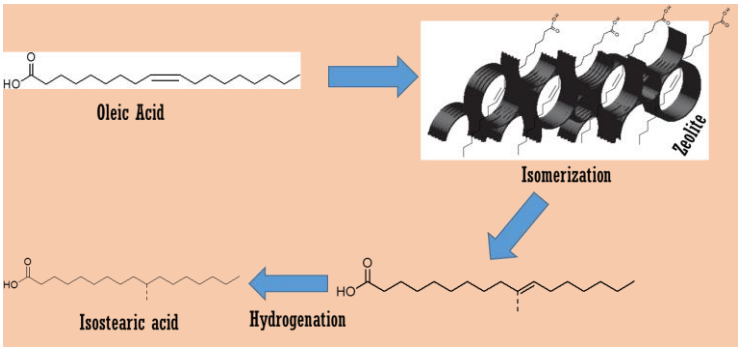
- Potential for increased growth and yield of crops under field conditions
- Potential for increased food security
- Potentially non-GMO by using gene-editing technologies

Applications

- The truncated Rubisco activase gene can be introgressed into commercial varieties of economically important plants or can be created in economically important plants

ARS Docket no. 173.16. Please contact Renee Wagner: renee.wagner@ars.usda.gov

Saturated Branched Chain Fatty Acid Production Method



Three novel catalytic methods of using ammonium cationic zeolites have been developed to produce saturated branched chain fatty acids (isostearic acid) from unsaturated linear chain fatty acid. The three selected zeolites (Ammonium Ferrierite, Ammonium ZSM-5 and Ammonium BETA) are found to produce three different compositions of isostearic acid products which will be different in physical properties and thus suitable for extended applications. High yield of product has been achieved in combination with specific co-catalysts and optimized reaction conditions even for large scale production.

Benefits

- Property variation in products from different catalytic system is useful to expand the overall application of isostearic acid
- Heat treatment for catalyst will make this technology cost effective and environmentally friendly
- Various zeolite-additives combinations suppress byproduct (dimer) formation effectively and thus produce high yield of isostearic acid

Applications

- Isostearic acid an important feedstock for the production of lubricant, cosmetics, emulsifiers, surfactants, biodiesel, hydraulic fluids and many more products

ARS Docket No. 48.16. Please contact Jim Poulos: jim.poulos@ars.usda.gov

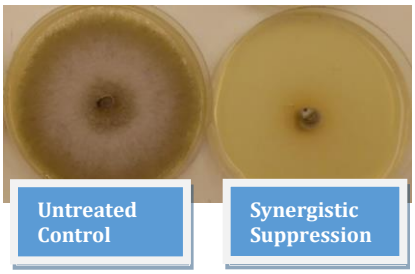
---

Sorghum Hybrids for Bird Food

ARS scientists have identified a class of sorghum mutants, named multiseeded (*msd*) that can produce normal grains in all flowers (spikelets). In normal sorghum, only the sessile spikelets can produce grains. The pedicellate spikelets will eventually abort and become chaff. The *msd* mutants have the potential to produce more than double the grain numbers per head with slightly reduced seed size suitable for bird food. The researchers have identified the genes that confer the *msd* traits. Thus, existing hybrids can be converted into *msd* hybrids through marker-assisted breeding or developed into new hybrids for bird food with the lab's collections of small seed lines.

Please contact Jeff Walenta: jeffrey.walenta@ars.usda.gov

***Xenorhabdus szentirmaii* Metabolites, Trans-Cinnamic Acid, and Analogs as Enhancers of Fungicidal Activity**



By-products derived from a naturally occurring symbiotic bacterium (*Xenorhabdus szentirmaii*) and *trans*-Cinnamic acid (TCA, another natural compound) can suppress various fungal diseases that attack plants. When these the bacterial by-products or TCA are added to certain commercially available fungicides the combinations cause synergistic levels of suppression.

Benefits

- Provides broad suppression against diverse fungi including important plant pathogen genera such as *Venturia, Monilinia, Glomerella* and *Rhizoctonia* and may also be effective against *Alternaria* and *Phytophthora*
- Could result in enhanced control of fungal diseases and a reduction in the use of fungicides in agriculture
- Compatibility with low-impact or organic fungicides will lead to improved environmental sustainability

Applications

- Safe and efficacious methodology to combat various plant diseases that affect diverse cropping systems

ARS Docket No. 7.16. Please contact Joe Lipovsky: joe.lipovsky@ars.usda.gov

---

Bioactive Peptides Having Insecticide Activity

Novel bioactive peptides for controlling fire ants (a *Solenopsis spp*.). The peptides act as antagonists to a fire ant receptor for a pheromone biosynthesis-activating neuropeptide/pyrokinin (PBAN/pyrokinin) gene derived neuropeptide ligand**.**

Benefits

- Cultures of *C. phragmitis* are more toxic to moth species than *C. subtsugae*
- An alternative to *Bacillus thuringiensis* with a broader activity spectrum

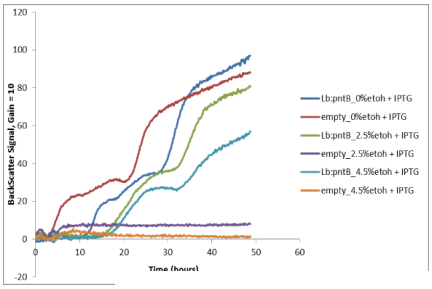
Applications

- Cultured C. phragmitis can be used as an organic insecticide with activity against lepidopteran and dipteran insect pests such as cabbage looper, diamondback moth, and seedcorn maggot
- Environmentally friendly pesticides for contolling fire ants

ARS Docket No. 244.12 + 135.17. U.S. Patent 9,771,393. Jim Poulos: jim.poulos@ars.usda.gov

---

Increased Alcohol Tolerance Using the pntAB Gene



A strain of *Lactobacillus buchneri* was isolated from a commercial ethanol production plant. The strain was found tolerant to up to14% ethanol. Complete genome sequence of the strain and further comparison analyses with *Oenococcus oeni* genome led to the identification of the pntAB locus as the functional element in this tolerance. The pntAB genes also confer ethanol tolerance traits in other microbes as included in the invention.

Benefits

- Robust alcohol tolerance genes can be introduced in other microbes to confer alcohol tolerance trait and increase survival in alcohol related stress environmental conditions
- Could result in higher product concentrations and improve product recovery

Applications

- Developing microbes with increased ethanol tolerance particularly in wine making and in industrial ethanol fermentation. Strains that tolerate higher alcohol concentrations can reduce production cost and increase production efficiency for industrial fermentation

JB Journal of Bacteriology

ARS Docket no. 195.16. Please contact Renee Wagner: renee.wagner@ars.usda.gov

---

Deeper Rooting1 Gene

The shape of a plant's root system impacts the resources it can access. The DEEPER ROOTING 1 (DRO1) gene assists in modulating the angle at which the roots grow. Knot-out mutations in the DRO1 gene lead to horizontal root growth, while plants that over-expressed DRO1 have more downward root growth.

Benefits

- More downward root growth may lead to increased access to water at deeper soil layers
- Potential for improving plant stability in soil

Applications

- Trees and other plants with altered root system shape to better access soil resources such as water and nutrients, as well as potentially improved anchorage

ARS Docket No. 106.15. U.S. Patent 9,771,393. Jim Poulos: jim.poulos@ars.usda.gov

---

Novel Polytriglycerides

A renewable source of polyketone, polyimine and polyamine vegetable oil generated with built-in functional groups in the structure; enables chelation or removal of heavy metal ions from aqueous solutions. The oil is heavier than water and can be regenerated and recycled after recovery of the heavy metal content.

Benefits

- High molecular mass compared to current neutralization agents
- Made from renewal resources in the form of vegetable oils

Applications

- Potentially used for neutralization, metalworking, metal ion absorption/extraction/sequestration
- Sequestration of toxic metal species from aqueous media and environmental purposes
- Biodegradable lubricating agents

ARS Docket no. 190.13 + 156.17. Please contact Renee Wagner: renee.wagner@ars.usda.gov

---

Bio-Based Methacrylic Acid and Other Alkenoic Derived Monomers via Catalytic Decarboxylation

Methacrylic acid is an important commodity monomer used for the production of many commercially significant polymers, most notably acrylic glass. The traditional route to methacrylic acid is petrochemically-based and involves the reaction of acetone with concentrated sulfuric acid and hydrogen cyanide. A novel method has been developed for selective catalytic decarboxylation to produce the organic acid, which consists of reaction of simple sugars from natural sources with appropriate catalysts in an aqueous solvent. This method can be used for synthesis of acrylic acid and other related monomers and provides an approach that can provide a renewable alternative to the current methods, thus further reducing the environmental impact of and demand for petroleum products**.**

Benefits

- A viable, bio-based alternative to producing methacrylic acid instead of using petrochemicals
- Requires lower operating temperatures and pressures and higher product selectivity than other bio-based methods, thus affording economical production of methacrylic acid

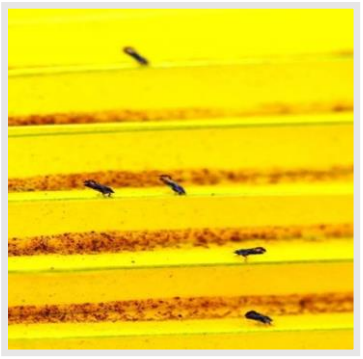
Applications

- 195A bio-based method for producing methacrylic acid

ARS Docket no. 70.14. Please contact Renee Wagner: renee.wagner@ars.usda.gov

---

Biopesticide Auto-Dissemination Method and Apparatus



The Asian citrus psyllid (ACP) harbors the bacterium that causes Huanglongbing or citrus greening disease, the most devastating citrus disease in the United States and the world today. Eradication of ACP is considered an important mechanism for control of citrus greening. ARS researchers have observed that the Asian citrus psyllid is susceptible to certain pathogenic fungi, which may be useful in suppressing ACP populations in situations where chemical control is prohibitive. ARS researchers working with Texas A&M University and University of Florida have developed formulations of pathogenic fungi that suppress ACP populations. Also developed is a biopesticide auto-dissemination apparatus structured to attract the insects, distribute the fungi and efficiently eradicate Asian citrus psyllids or other insects that exhibit "thigmotaxis" behavior.

Benefits

- Currently there are no means of controlling or suppressing ACP in dooryard citrus absent highly invasive and difficult measures such as tree removal
- The auto disseminator is simply hung from a tree branch

Applications

- ACP is susceptible to pathogenic fungi, which may be useful in suppressing ACP populations in situations where chemical control is prohibitive, such as residential areas (referred to as 'dooryard' citrus by growers)
- When ACP contact the auto-disseminator, a biopesticide deposited in the substrate pleats infects and ultimately kills the ACP
- Could be used by homeowners in neighborhoods near commercial citrus orchards

ARS Docket No. 5.10. Please contact Jeff Walenta: jeffrey.walenta@ars.usda.gov

---

Fire Retardant

Wildfires continue to plague the western United States, and elsewhere. Last year in California alone, wildfires caused an estimated $12 billion in damages. Because of population growth and encroachment of human habitat into forested / woody areas, combined with climate change, the threat from wildfires is expected to worsen. Many threat reduction strategies are being developed, one of which is a "fire retardant gel," that has been created by ARS scientists. The gel is formed when a powder, comprised of a mixture of sodium bentonite and corn starch, is combined with water. The gel can be applied to structures in the path of a wildfire and provide for 20-30 minutes of fire protection, which research has shown is generally long enough to permit the structure to survive. The formula has been patented and the ARS is in need of an entrepreneurial company interested in licensing the patent and developing a business model for quick deployment of the fire-retardant gel. ARS scientists are available to form a Cooperative Research and Development Agreement to help any licensee develop appropriate deployment techniques / processes. For more information, please contact David Nicholson, at David.Nicholson@ars.usda.gov

.

Check out these ARS Amaryllis varieties available for licensing:
https://www.ars.usda.gov/ARSUserFiles/ott/Avail%20Plants.pdf

Amaryllis 'Boca'

Amaryllis 'Jax'

Amaryllis 'Miami'

Amaryllis 'Orlando'

Amaryllis 'Tampa'

Please contact Robert Griesbach:
robert.griesbach@ars.usda.gov

Available Technologies for Licensing

Each year, approximately 60 new patents are issued by the U.S. Patent Office for USDA inventions. The Office of Technology Transfer (OTT) transfers these inventions through licenses to the private sector for commercialization. Here is a link to *recently filed* U.S. patent applications that are available for licensing. This list is updated monthly so check back often! http://www.ars.usda.gov/Business/Business.htm.

ARS Technology Transfer at a Glance:

https://www.ars.usda.gov/ARSUserFiles/ott/TT%20at%20a%20Glance.pdf

Resources for Businesses:

https://www.ars.usda.gov/ARSUserFiles/ott/ARS%20_Resources%20for%20Businesses.pdf

ARS Digital Online Research Magazine

AgResearch is a monthly publication highlighting short features on the scientific research discoveries occurring at all of ARS' research laboratories across the Nation and abroad. View *AgResearch* at http://agresearchmag.ars.usda.gov. One can subscribe to electronic delivery of the magazine on the website.

USDA Blog

Check out USDA Blog site for updates on Agricultural issues: http://blogs.usda.gov. One can sign up for email updates on the website by checking boxes of categories of interest including the blog, news categories and social media.

We are seeking contributions for future ARP Network Notes from members who wish to share information that would be of interest to the group. Suggestions include events, Ag challenges and community initiatives. For ideas of content for future notes, please contact Cathy Cohn at cathleen.cohn@ars.usda.gov.

Get more information: www.ars.usda.gov

January 2018